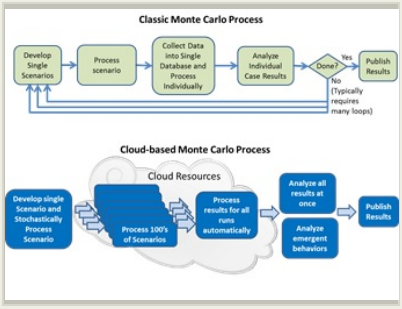
Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Crown Consulting, Inc. proposes a new method of concept verification and validation for autonomous operations and identifying emergent behaviors. This method integrates several Internet technologies to enable massively parallel execution of National Airspace System (NAS) simulations in a cloud environment, vastly increasing the number of Monte Carlo simulation runs that can be executed in a given time, thus enabling broad assessments of safety, performance, and workload across thousands of scenarios representing wide ranges of conditions. Potential uses include verification and validation of concepts for autonomous UAS operations, validation of advanced NAS concepts, identifying emergent behavior, data mining and discovery, and development of SMART NAS Phase I will establish feasibility by demonstrating greatly reduced run time by running thousands of simulation cases at a time; automated system performance and safety evaluation; and capabilities for rapid analysis of safety, performance, and workload related to NAS operations.. The proposed effort will establish baseline scenarios, identify a suitable configuration of the Airspace Concept Evaluation System (ACES), implement an interface for creating a large set of scenarios, set up ACES for a cloud environment, create an interface for executing Monte Carlo runs in the cloud, demonstrate use as an automated cloud-based analysis tool, and define a SMART NAS Testbed for Phase II. The Phase II effort will establish requirements to support near-term applications, define a system architecture and design, and conduct prototype testing and demonstration. Potential applications of this concept to meet NASA needs include analysis of UTM and other concepts for managing UAS operations, prognostic safety assessments, NAS performance assessments, amplifying the capabilities of existing simulation models, exploring applications of autonomy, and real-time evaluation of traffic flow management strategies.



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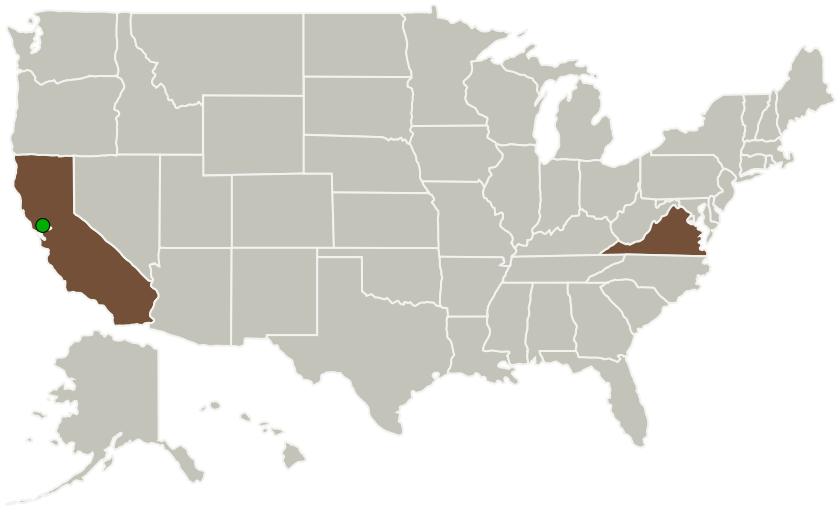
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Crown Consulting, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Arlington, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

June 2015: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Crown Consulting, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Cobb

Co-Investigator:

Paul N Cobb

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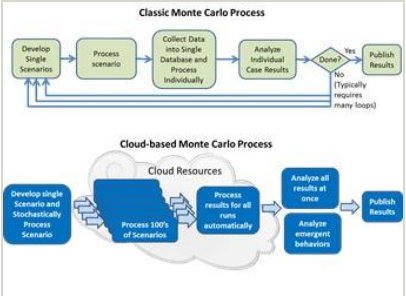
December 2015: Closed out

Closeout Summary: Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139418)*

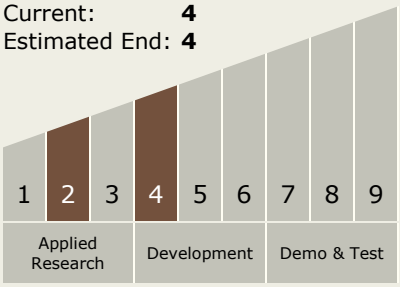
Images



Briefing Chart Image
Verification & Validation of Complex Autonomy Concepts Using the Cloud, Phase I
(https://techport.nasa.gov/image/136572)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.1 Integrated Systems and Ancillary Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System